INDEX TO VOLUME V.

* Denotes an Illustrated Article.

PAGE.

Admiralty boiler committee, report * ... 586
Air pressure, effect of on power ... 743
Alarm, H. M. S., description ... 510
trials ... 748
Aluminum ... 191
Aluminum boat ... 1031
Aluminum, effect of heat on ... 718
America's cup, contest for ... 998
Amsler's polar planimeter, description ... 665
Anderson, M. A., trial of the *New York* ... 613
Annual meeting ... 253
Anti-friction metal, Delta white, tests of ... 717
Astræa, description ... 518
Atlantic, possibilities of speed on, Biles ... 710
Atlantic record ... 1019
Auxiliaries, effect of on economical speed ... 66, 474
Averaging instrument, Coffin's ... 679

Bailey, F. H., air pump ... 731
Baird, G. W.—Discussion of paper on economical speed ... 108
Bancroft, contract trial ... 204, 365
Bangor, Fall River steamer ... 1087
Barham, trials ... 517, 743
Barnaby, S. W.—Discussion on arrangement of surface of screw propeller ... 320
On water-tube boilers ... 954
Barton, J. K.—Contract trials of the *Machias* and *Castine* ... 846
Basic Bessemer Steel, order of Navy Department permitting its use rescinded, 196
Battleships, comparison of French, English, Russian and United States ... 1066
Biles, J. H.—Possibilities of speed on the Atlantic ... 710
Blake pumping engine, duty trial at City Water Works, Newton.—Dean ... 465
Blake, speed of ... 508
Blenheim, speed of—White ... 508
Brooklyn, bids for ... 201
Bugeaud, launch and dimensions ... 1064
Boiler Committee, Admiralty, report * ... 586
Boiler construction, marine, Stromeyer ... 890

Boilers, Babcock and Wilcox in S. S. *Nero* 935
Belleville * 941
for *Sharpshooter* 1031
in French Navy * 933
in Merchant Service 934
Du Temple * 946
Lagrafel-d'Allest* 938
test of 949
marine 327
care of, Forsyth 574
Mosher, in *Feineen* 765
Normand * 946
Oriolle * 940
Towne * in *William Windom* 988
Thornycroft * 945
of *Geiser* 163
Weight 167
Ward, in *Monterey* 127
Water-tube, Milton 931
Yarrow 947
of H. M. S. *Crescent, Edgar, Jason, Monarch, Royal Sovereign, Sybille, Thrush*, illustrated, follow 606
Book reviews.—Alternating currents, Bedell and Crehore 529
Alternating currents of electricity, Knapp 529
Busley's naval and merchant steamers 528
Continuous current dynamos and motors 1097
Electrical tables and memoranda, Thompson 528
Electricity and magnetism 252
"Engineering" for April 21, 1893 527
Hand-Book of the Steam Engine 1095
Logarithmic tables 251
Practical instructions for using the steam-engine indicator 1096
Resistance of ships and screw propulsion 1094
Standard tables for electric wiremen 1098

Calvert, George A., measurement of wake currents 869
Cambrian, data of hull and machinery 510
Campania, best speed 1019
comparison with *Great Eastern* 810
description, full 385
dimensions 810
first voyage 409, 754
height of smoke pipes 247
speed 818
speed trials 405
Camperdown, repairs to 1041

Capitan Prat, description and trial 231
voyage from Toulon to Talcahuano 1066
Car ferry *Sainte Marie* 759
Castine, contract trial 846
Centurion, trials 1044
Cevic, S. S., description 1076
Charles Martel, launch and description 1063
Charleston, coal expenditure for different purposes 70
Christopher Columbus *, whaleback, description 240
Cincinnati, running lines for shafting of * 1
Circe, description 510
trials 512
Circulating pumps, Leopold 295
City of Lincoln, S. S., steam-pipe explosion 351
City of Lowell, S. S., description 1088
Classification Society, new 661
Coal consumption trial, *New York* 635
Coffin's averaging instrument 679
Columbia, official trial 1034
Colonia, yacht, description 998
Commerce on the Great Lakes.—Brock 153
Connecting rods, method of considering obliquity in valve diagrams * 991
Cooper, Theodore, C. E., specifications 559
Cramp's floating derrick * 477
Crane, large pillar 193
Cranes,* modern.—Warren 921
Crescent, H. M. S., description 746
trial 747
Crockett, C. W.—Amsler's polar planimeter 665
Cup defenders 650
Currents, wake, measurment of 869
Curry, S. S., description 761
Curves arising in engineering, analysis of, Durand 543

Deadman, H. E.—Application of electricity in royal dockyards 178
Dean, F. W.—Duty trial of Blake pumping engine at Newton, Mass 465
Delta white anti-friction metal, tests of 717
Denig, R. G.—Contract trials of the *Machias* and *Castine* 846
D'Entrecasteaux, description 751
Derrick, floating,* at Cramp's 477
Descartes, description 519
Detroit, contract trial 500
Devastation, new machinery and trial 1046
D'Iberville, launch of 1063
Dickinson screw propeller on *Herongate* and *Belle of Dunkerque* 313
Draft, induced, experiments * 828

Dunell, —.—Discussion on arrangement of surface of screw propeller..... 321
Dupuy de Lôme, accident to boilers..... 1061
Durand, W. F.—Analysis of certain curves..... 543
Durston, A. J.—Transmission of heat through tube plates *..... 436

Effect of size of ship upon speed..... 818
form upon speed..... 819
draught of water upon speed..... 821
Electric lighting of S. S. *Tchihatchoff*..... 183
Electricity, application of in royal dockyards..... 178
Electric traveling cranes..... 921
Elgar, Francis.—Fast ocean steamships *..... 808
Ellis, J. D.—Induced draft and hot air in boilers fitted with Serve tubes and retarders..... 828
El Primero, yacht, data and trials..... 1090
Ely, George H.—The Great Lakes of North America..... 140
Emery, C. E.—Discussion of paper on economical speed..... 93
Endymion, trials..... 745
Engineering Congress, International..... 532
summary of papers..... 637
Experimental tank for Russia..... 194

Failure of metal structures from fatigue..... 1026
Fast ocean steamships.*—Elgar..... 808
Feed-water heater, Gilmour's..... 578
Worthington's *..... 342
heating, Peck-Wheeler system*..... 196
modern methods of introducing*..... 984
Feiseen, description and trial..... 763
Ferrules, boiler tube *..... 449
tube, in British navy..... 715
Fitts, James H., obituary..... 1100
Flach, Emil, obituary..... 1100
Fleurus, description..... 520
Forsyth, Robert.—Care of marine boilers..... 574
Discussion of paper on economical speed..... 104
Freeman, E. R.—Trial of the *New York*..... 613
French shipbuilding programme..... 749
Froude, R. E.—Discussion on arrangement of surface of screw propeller..... 317
Furnaces, Farnley *..... 24
Fox *..... 27
Holmes *..... 24
Morison *..... 27
Purves *..... 24
tests of..... 38
marine boiler,* Morison..... 11
discussion on..... 413

Gage, Howard.—Contract trial of the *Monterey* *.... 115
Galatea, trials.... 743
Gauge glasses, Scholt and Gens'.... 192
Geddes.—Discussion on marine boiler furnaces.... 418
Geiser, Thornycroft boilers of.... 163
Gibraltar, H. M. S., description.... 731
natural draft trial.... 738
Gloucester, S. S. Merchants' and Miners' Co.... 758
trial.... 1086
Gothic, White Star Line, launch.... 757
Gow, J. L.—Discussion of paper on economical speed.... 112
Grafton, description.... 504
trials.... 744
Great Eastern, comparison with *Campania*.... 810
dimensions.... 810
speed.... 815
Griffin, R. S.—Contract trial of *Bancroft*.... 365
Gunboat No. 7, description.... 722
Gunboats 8 and 9, description.... 727
Gunboats Nos. 7, 8 and 9, bids for construction of.... 1037
Guy, A. E.—Graphic method of considering the obliquity of connecting rods in valve diagrams *.... 991
Havock, description.... 655
trials.... 1056
Hercules, trial of new machinery.... 220
Hollis, Ira N.—Economical speed and coal endurance.... 66
Hornet, description.... 655
Howden, Jas.—Discussion of paper on transmission of heat through tube plates.... 462
Hudson, revenue cutter, trial.... 703
Hydraulic press *vs.* steam hammer.... 715

Iowa, bids for.... 201
Isherwood, B. F.—Digest of Prof. Peabody's test of pumping engine, Newton, Mass.... 769
Discussion of paper on economical speed.... 83
Experimental comparison of a single-cylinder engine with a triple-expansion engine.... 271
Independencia, description.... 229
Indiana, launch and description.... 492
Indicators, comparison of Thompson, Tabor and Crosby.... 1025
Induced draft, experiments *.... 828
Infanta Maria Teresa, description and trials.... 960
International Engineering Congress.... 532
summary of papers.... 637
International S. S. Co.... 235

Jason, description and trial 226
Jaureguiberry, launch and description 1064
Joy, pipe boilers in U. S. 462
Jubilee, yacht, description 998

Kassarsky, weight of machinery 171
Katahdin, launch of 202
Kearney, Geo. H.—Running lines for the shafting of the *Cincinnati* * 1
Keels, bilge, advantage of 824
Kennedy, Alex.—Discussion on arrangement of surface of screw propeller 322
Kinkaid, T. W.—Discussion of paper on economical speed 105

Lakes, Great, of North America 140
commerce on 153
Langton.—Discussion of paper on transmission of heat through tube plates 458
Lansquenet, torpedo boat, description 1063
Leda, description 510
trials 1060
Leopold, H. G.—Circulating pumps 295
Libertad, description and trial 229
Liguria, S. S., trial and machinery 1075
Lucania, bunker capacity 1069
first voyage 1020
maiden voyage 1069
second voyage 1021

Machias, contract trial 720, 846
Magnificent, description 1038
Maine, dock trial 719
third class torpedo boat 729
Majestic, H. M. S., description 1038
Manola, Minn. S. S. Co., dimensions and statement of operations 151
Marie Henriette, S. S., trial 1086
Marine boiler construction.—Stromeyer 890
Marine boilers 327
Massachusetts, launch of 721
Mattice, A. M.—Arrangement of machinery for full power and for cruising * 100
Discussion of paper on economical speed 95
McAllister, A. A.—Trial of the *Hudson* 703
McAllaster, E. L.—Performance of S. S. *City of Alpena* 973
MERCHANT STEAMERS.—*Belle of Dunkerque*, trial with Dickinson screw propeller 313
Bayern, lengthened 1077
Campania, first voyage 409
full description 385
height of smoke pipes 247
speed trials 405
time of passage 754

MERCHANT STEAMERS.—(Continued.)
Cevic, description 1076
Christopher Columbus *, description 240
City of Alpena, description and performance 973
City of Lowell, description 1088
Curry, description 761
Express passenger steamers for the Lakes 238
Gloucester, M. & M. Trans. Co 758
trial 1086
Gothic, White Star line, launch 757
Herongate, trial with Dickinson screw propeller 313
International Co.'s new steamers 522
Isle of Arran, paddle-wheel 525
Liguria, trial and machinery 1075
Lucania, bunker capacity 1069
maiden passage 1069
Manola, dimensions, and statement of operations 151
Manitou, description 524
Marie Henriette, trial 1086
Mohawk, Western Transit Co 760
Nile, trial and description 1069
Paris, fast passage from Southampton 755
Peru, description and trial 233
Pioneer, description and trial 245
Roland, dimensions and trial 1077
Southwark, American Line 757
Tchihatchoff, electric lighting of 183
Trave, broken shaft of 188
Umbria, repairing shaft of * 185
Metal structures, failure from fatigue 1026
Milton, J. T.—Discussion on marine boiler furnaces 413
water-tube boilers for marine purposes 931
Minneapolis, launch of 721
Mohawk, S. S., Western Transit Co 760
Monterey, contract trial * 115
Montgomery, grounding of 1034
Morgan, Leo.—Union Iron Works method of aligning shafting and boring out stern tubes * 7
Morison, D. B.—Reply to discussion on marine-boiler furnaces 420
Marine boiler furnaces * 11
Motive power of small vessels 882
Mudd, T.—Tail shaft preserver 712

Namouna, yacht, description of new machinery, and trial 1084
Navahoe, description * 650
NAVAL VESSELS.—*Alarm*, H. M. S., description 510
trial 748

NAVAL VESSELS.—(Continued.)

Alert, dimensions 518
Astraea, description 518
Bancroft, contract trial 204, 365
Barham, trials 517, 743
Blake, speed of 508
Blenheim, speed of.—White 508
British, launched in 1892 226
Brooklyn, bids for 201
Bugeaud, launch and dimensions 1064
Cambrian, data of hull and machinery 510
Camperdown, repairs to 1041
Capitan Prat, description and trial 231
voyage, Toulon to Talcahuano 1066
Castine, contract trial 846
Centurion, trials 1044
Charles Martel, launch and description 1063
Charleston, coal expenditure 70
Circe, description and trial 510
Columbia, official trial 1034
Crescent, description and trial 746
Cruisers, English, new second class 516
D'Entrecasteaux, description 751
Descartes, description 519
Detroit, contract trial 500
Devastation, new machinery and trial 1046
D'Iberville, launch of 1063
Dupuy de Lome, accident to boilers 1061
Eclipse, dimensions 516
Endymion, trials 745
Fleurus, description 520
Galatea, trial 743
Geiser, Thornycroft boilers of 163
Gibraltar, description 731
natural-draft trial 738
Grafton, description 504
trials 744
Gunboat No. 7, description 722
Gunboats Nos. 8 and 9, description 727
Gunboats Nos. 7, 8 and 9, bids for construction of 1037
Hercules, trial of new machinery 220
Independencia, description 229
Indiana, launch and description 492
Infanta Maria Teresa, description and trials 960
Iowa, bids for 201
Jason, description and trial 226

NAVAL VESSELS.—(Continued.)

Jaureguiberry, launch and description 1064
Kasarsky, weight of machinery 171
Katahdin, launch of 201
Leda, description 510
Libertad, description and trial 229
Machias, contract trial 720, 846
Magnificent, description 1038
Maine, dock trial 719
Majestic, description 1038
Massachusetts, launch of 721
Minerva, dimensions 516
Minneapolis, launch of 721
Monterey, contract trial * 115
Montgomery, grounding of 1034
New York, contract trial * 613
coal consumption trial 635
preliminary trial 499
Niger, trial 743
Nueve de Julio, description and trial 501
Olympia, preliminary trial 1033
Oregon, launch of 1034
Philadelphia, run from Callao to Honolulu 1032
Pique, description 211
trial 216
Possadnik, trial 228
Rainbow, description 211
trial 216
Ramilles, machinery 740
trials, engine 741
gun 1041
Renard, trial 1061
Renown, description 515
Repulse, trials 512
Resolution, trials 1039
Retribution, description 211
trial 216
Revenge, description 223
Royal Oak, description 221
Rurik, launch of 228
Sharpshooter, Belleville boilers for 1031
Speedy, description 684
Stern-wheel steamer for Argentine 248
Talbot, dimensions 516
Theseus, description 1049
Thule, description 521

NAVAL VESSELS.—(Continued.)
Thunderer, trial ... 453
Torch, dimensions ... 518
Trehouart, description ... 750
Turkish vessels under construction ... 232
Victoria, sinking of * ... 693
Wojewoda, trial ... 228
Yoshino, launch and description ... 231
trial ... 1068
New York, preliminary trial ... 499
contract trial ... 613
New York, S. S., best speed ... 1019
Nickel-steel armor trials at Creuzôt ... 1028
Niger, trial ... 743
Nile, S. S., trial and description ... 1069
Normand, J. A.—Engine vibration * ... 980
Nueve de Julio, description and trial ... 501

Obituary, Woods, A. T. ... 255
Olympia, preliminary trial ... 1033
Oregon, launch of ... 1034

Paddle-wheel steamer *Isle of Arran* ... 525
Painting wood and iron.—Brown ... 713
Paris, fast passage from Southampton ... 755
Parson's steam turbine * ... 899
Peabody, Cecil H.—Test of pumping engine, Newton Water Works ... 769
Peck-Wheeler system of feed-water heating * ... 196
Peru, S. S., description and trial ... 233
Petroleum briquettes ... 1030
Petroleum residuum, effect of shell fire on tanks of ... 486
Philadelphia, run from Callao to Honolulu ... 1032
Pilgrim, yacht, description ... 652, 998
Pioneer, S. S., description and trial ... 245
Pipes, steam.*—Brett ... 347
Pique, H. M. S., description ... 211
trial ... 216
Planimeter, Amsler's polar, description ... 665
Portland cement for steam joints ... 194
Possadnik, trial ... 228, 752
Power, motive, of small vessels ... 882
Powerful, brief mention ... 516
Propeller, screw, arrangement of surface * ... 300
Pumping engine, Newton Water Works ... 769
Pumps, circulating.—Leopold ... 295

Rainbow, description ... 211
trial ... 216

Raleigh, supports for boring bars for stern tubes and struts.*—Roelker..... 340
Ramillies, machinery..... 740
trials.....515, 741
guns..... 1041
Raynal, A. H.—Diagram for finding I.H.P..... 378
Renard, trial..... 1061
Renown, description..... 515
Repulse, trials..... 512
Resolution, trials..... 1039
Retribution, description..... 211
trial..... 216
Revenge, description..... 223
Revolution recorder.—Weaver.—On trial of *Bancroft*..... 377
Roelker, C. R.—Supports for boring bars for stern tubes and struts *..... 340
Roland, S. S., dimensions and trial..... 1077
Royal Oak, description..... 221
Rurik, launch of..... 228

Sappho, description and trial..... 218
Sainte Marie, car ferry, description..... 759
Scholt and Gens.—Gauge glasses..... 192
Scott, John.—Discussion of paper on transmission of heat through tube plates... 460
Screw propellers, apparatus for ascertaining the efficiency of *..... 970
arrangment of the surface of.*—Walker..... 300
Dickinson.—Trial on *Herongate* and *Belle of Dunkerque*..... 313
Screw turbine propeller, * Thornycroft's..... 479
Scylla, description and trial..... 218
Seagull, trial with tubes ferruled..... 715
Seaton, A. E.—Discussion of paper on transmission of heat through tube plates.. 461
Shaft, broken of *Trave*..... 188
Umbria..... 185
Shafting, *Cincinnati*, running lines for *..... 1
practice of Union Iron Works in aligning *..... 7
Shaft preserver, tail.—Mudd..... 712
Shafts, failure from fatigue..... 1027
Sharpshooter, Belleville boilers for..... 1031
Shipbuilding programme, British navy, new..... 486
French..... 749
statistics of, in United States..... 159
Smoke pipes, high..... 175
Southwark, S. S., American Line..... 757
Specifications.—Cooper..... 559
Speed, classified, of British naval vessels..... 190
economical, effect of auxiliaries on.—Wheeler..... 474
Speedy, description..... 684
trials..... 1060

Steamers, longevity of modern 1029
Steam hammer *vs.* hydraulic press 715
Steam pipes* .—Brett 347
Steamships, fast ocean.—Elgar 808
Steel castings*.—Strickland 39
Steel *vs.* iron tubes 1030
Stern tubes, boring out* 1 7
and struts, supports for* 340
Strickland, G. D.—Steel castings* 39
Stromeyer.—Discussion of paper on transmission of heat through tube plates... 458
Marine boiler construction 890
Suez canal, traffic in 716
Sybille, trial 519

Terrible, brief mention 516
Texas, third-class torpedo boats, description 729
Theiss, Emil.—Contract trial of the *Monterey* * 115
Theseus, description 1049
machinery 1054
Thornycroft, J. I.—Discussion on arrangement of surface of screw propeller... 319
Thornycroft's screw turbine propeller* 479
Thule, description 521
Thunderer, trial 453
TORPEDO BOATS.—*Daring*, description 517
Decoy, description 517
Havock 517, 655, 1056
Hornet 517, 655
Lansquenet, description 1063
strength of 483
third-class for *Maine* and *Texas* 729
Trave, broken shaft of 188
Trehouart, description 750
TRIALS, *Alarm* 748
Barham 743
Capitan Prat 231
Castine 846
Centurion 1044
Circe 512
Columbia 1034
Detroit, contract 500
Devastation 1048
Endymion 745, 747
Galatea 743
Geiser 165
Gibraltar 738
Havock 1056

TRIALS.—(Continued.)
Hercules ... 220
Infanta Maria Teresa ... 960
Leda ... 1060
Libertad ... 230
Machias ... 720, 846
New York, preliminary ... 499
Niger ... 743
Nueve de Julio ... 501
Olympia, preliminary ... 1033
Pique ... 216
Possadnik ... 228, 752
Rainbow ... 216
Ramillies ... 515, 741
Renard ... 1061
Repulse ... 512
Resolution ... 1039
Retribution ... 216
Sappho ... 218
Scylla ... 218
Seagull, with tubes ferruled ... 715
Speedy ... 1060
Sybille ... 519
Thunderer ... 453
Vulcan, with ferruled tubes ... 514
Wojewoda ... 228
Yoshino ... 1068
Triple-expansion engine, experimental comparison of a single cylinder engine with a.—Isherwood ... 271
Turbine, Parson's steam * ... 899
Turbine propeller,* Thornycroft's screw ... 479
Tube plates, Kirk's experiments with different thicknesses of ... 33
Tube plates, transmission of heat through.*—Durston ... 436
Tubes, boiler, arrangement of in *Barham* and *Bellona* ... 333
Tubes, steel *vs.* iron ... 1030

Umbria, best speed ... 1019
repairing shaft of * ... 185
Unwin, W. C.—Tests of Delta white anti-friction metal ... 717

Valiant, steam yacht ... 759, 1078
Valkyrie, yacht, dimensions ... 1004
races with *Vigilant* ... 1005
Vibration, engine * ... 977
Victoria, sinking of * ... 693
Vigilant, yacht,* and dimensions ... 998

Vigilant, description 652
races with *Valkyrie* 1005
Vulcan, trial 514

Wake currents, measurement of * 869
Walker, William G.—Arrangement of the surface of a screw propeller * 300
Walliker, John F.—Discussion on marine-boiler furnaces 418
Warren, B. H.—Modern cranes * 921
Weaver revolution recorder on trial of *Bancroft* 377
Weight of engine and locomotive boilers of *Kassarsky* 171
Thornycroft boilers, *Geiser* 167
Ward boilers, *Monterey* 134
Water-tube boilers for marine purposes.*—Milton 931
Whaleback, built in England 762
Wheeler, F. M.—Effect of auxiliaries on economical speed 474
White, W. H.—Discussion on water-tube boilers 957
William Windom, revenue steamer, machinery * 988
Wojewoda, trial 228, 752
Worthington's feed-water heater 342

Yacht, fast small (*Fifteen*) 249
Yarrow, A. F.—Discussion of paper on transmission of heat through tube plates 454
Discussion on water tube boilers 952
Yoshino, launch and description 231
trial 1068